

WHAT IS CLAIMED IS:

1. An apparatus for measuring surface displacements, comprising:
  - a light source which projects a beam of light upon a surface; and
  - a detector that has a number of pixels at least about 50% larger than a number used for a surface displacement measurement.
2. The apparatus of claim 1, wherein only a subset of the pixels in a pixel address window in the detector participates in a correlation calculation.
3. The apparatus of claim 2, further comprising:
  - a controller which determines the pixel address window as the area containing those pixels having best or sufficient correlation characteristics.
4. The apparatus of claim 3, wherein the correlation characteristics include intensity characteristics and uniformity characteristics.
5. The apparatus of claim 1, further comprising:
  - an aperture which blocks light in the beam at an intensity less than about 80% of a maximum beam intensity.
6. The apparatus of claim 2, further comprising:
  - a controller which identifies a correlation area in two overlapping stored images, which contains pixels which will participate in the correlation calculation.
7. The apparatus of claim 6, further comprising a comparing circuit which performs a correlation calculation using the pixels in the correlation area.
8. The apparatus of claim 2, wherein the pixel address area is between about 200 and about 300 pixels on each side.
9. The apparatus of claim 1, wherein the light source is a source of coherent radiation, the beam spot contains a speckle pattern reflected from the surface.
10. The apparatus of claim 1, wherein the light source is an incoherent light source, and the surface includes a scale pattern indicative of displacement.
11. The apparatus of claim 2, wherein the pixel address area contains pixels having a predetermined threshold intensity and a predetermined threshold contrast compared to neighboring pixels.
12. A method for measuring a surface displacement, comprising:
  - directing a beam of light from a light source onto a target surface;

reflecting the beam from the target surface and into a beam spot on a detector, wherein the detector has a number of pixels at least 50% larger than the number used in a surface displacement measurement;

determining a subset of pixels of the detector which are to be used in the surface displacement measurement; and

measuring a surface displacement using the subset of pixels.

13. The method of claim 12, further comprising:

performing an interpolation to determine the surface displacement.

14. The method of claim 13, wherein the subset is a pixel address window, containing between about 40000 and about 90000 pixels.

15. The method of claim 13, wherein the determining step comprises determining a pixel address window, wherein the pixel address window includes the subset of pixels on the detector which have the best or sufficient intensity and uniformity characteristics.

16. The method of claim 15, wherein the detector has an area at least about 4 times larger than the pixel address window.

17. The method of claim 12, further comprising:

determining a pixel correlation area within the subset, containing pixels which will participate in a correlation calculation.

18. The method of claim 17, wherein the pixel correlation area contains between about 10000 and about 22500 pixels.

19. The method of claim 12, further comprising:

providing an aperture which blocks light in the beam having an intensity less than a predefined threshold intensity.

20. The method of claim 19, wherein the predefined threshold intensity is less than about 80% of a maximum beam intensity.

21. The method of claim 12, further comprising:

decoding a pattern applied to the target surface and illuminated by the beam, to determine an amount of displacement which the target surface has undergone.

22. An apparatus for measuring a surface displacement, comprising:

means for directing a beam of light from a light source onto a target surface and reflecting the light from the target surface onto a detector;

means for determining a subset of pixels on the detector within the beam spot of the light beam reflected from the surface; and

means for measuring a surface displacement using a portion of the subset of pixels.